VOLUME 157 CONTENTS

NUMBER 1, JANUARY 1996

1–7 MEGASPORE ABORTION: A CONSEQUENCE OF SELECTIVE APOPTOSIS?
P. R. Bell

8–16 APOPTOSIS DURING DIPLOID PARTHENOGENESIS AND EARLY SOMATIC EMBRYOGENESIS OF NORWAY SPRUCE
L. Havel and D. J. Durzan

17–26 PROTEIN UBIQUINATION IN DIPLOID PARTHENOGENESIS AND EARLY EMBRYOS OF NORWAY SPRUCE
Don J. Durzan

27–39 COMPARATIVE DEVELOPMENT OF ZYGOTIC AND MICROSPORE-DERIVED EMBRYOS IN *BRASSICA NAPUS* L. CV TOPAS. I. HISTODIFFERENTIATION
Edward C. Yeung, M. Hafizur Rahman, and Trevor A. Thorpe

40–48 THE CARUNCLE OF *RICINUS COMMUNIS* L. (CASTOR BEAN): ITS DEVELOPMENT AND ROLE IN SEED DEHYDRATION, REHYDRATION, AND GERMINATION
Massimo Bianchini and Ettore Pacini

49–52 FACTORS AFFECTING EMBRYO ABORTION IN *SYZYGIUM CUMINII* (L.) SKEELS (MYRTACEAE)
H. S. Arathi, K. N. Ganeshaiah, R. Uma Shaanker, and S. G. Hegde

53–62 THE RELATIONSHIP OF ENDOPHYTIC FUNGI TO THE GAMETOPHYTE OF THE FERN *SCHIZAEA PUSILLA*
Lucinda J. Swatzell, Martha J. Powell, and John Z. Kiss

63–70 WOUND PERIDERM DEVELOPMENT IN RED MANGROVE, *RHIZOPHORA MANGLE* L.
Andrew M. Wier, Micaela Anita Schnitzler, Terry A. Tattar, Edward J. Klekowski, Jr., and Arthur I. Stern

71–79 TRANSIENT OLEOSOMES (LIPID BODIES) IN EARLY DIFFERENTIATION OF *SESBANIA ROSTRATA* NODULES
Arya K. Bal and Srinivas Denduluri

80–91 THE NACREOUS SIEVE-ELEMENT WALL IN HEALTHY AND IN MLO-INFECTED APPLE TREES
Michael Georg Schlag and Monika Gal

92–102 FINE STRUCTURAL ASPECTS OF COTTON FIBER ATTACHMENT TO THE SEED COAT: MORPHOLOGICAL FACTORS AFFECTING SAW GINNING OF LINT COTTON
Eugene L. Vigil, W. Stanley Anthony, Eugene Columbus, Eric Erbe, and William P. Wergin

103–109 CRASSULACEAN ACID METABOLISM IN THREE SPECIES OF THE C_4 GENUS *PORTULACA*
Anthony A. Kraybill and Craig E. Martin

110–117 SALINITY STRESS EFFECTS ON [^{14}C-1]- AND [^{14}C-6]-GLUCOSE METABOLISM OF A SALT-TOLERANT AND SALT-SUSCEPTIBLE VARIETY OF WHEAT
S. KrishnaRaj and T. A. Thorpe

118–122 IN SITU LOCALIZATION OF NADP-MALIC ENZYME IN BUNDLE SHEATH CELLS AND LEAF CARBON ISOTOPE FRACTIONATION IN TWO C_4 GRASSES
S. Madhavan, Carlos S. Andreo, Veronica G. Maurino, and Marion H. O'Leary

123–128 ESTABLISHMENT AND PERSISTENCE CHARACTERISTICS IN JUVENILE LEAVES AND PHYLLODES OF *ACACIA KOA* (LEGUMINOSAE) IN HAWAII
David H. Hansen

129–135 VARIATION IN LEAF STRUCTURE AND FUNCTION IN *QUERCUS DOUGLASII* TREES DIFFERING IN ROOT ARCHITECTURE AND DROUGHT HISTORY
Ragan M. Callaway and Bruce E. Mahall

136–141 GENOME ANALYSIS OF EURASIAN *ELYMUS THOROLDIANUS*, *E. MELANTHERUS*, AND *E. KOKONORICUS* (TRITICEAE: POACEAE)
Kevin B. Jensen

142–150 KARYOTYPE VARIATION IN SOUTH AMERICAN *ELYMUS* (TRITICEAE)
Silvina M. Lewis, Arturo J. Martínez, and Jorge Dubcovsky

151–152 SYMBOLS AND ABBREVIATIONS COMMONLY USED IN *INTERNATIONAL JOURNAL OF PLANT SCIENCES*

NUMBER 2, MARCH 1996

153–158 WOUND-INDUCED ETHYLENE AND GERMINATION OF EMBRYOS EXCISED FROM DORMANT *AVENA FATUA* L. CARYOPSES
Harwood J. Cranston, Anthony J. Kern, Shirley A. Gerhardt, and William E. Dyer

159–163 METABOLISM OF SUCROSE DURING STORAGE IN INTACT SORGHUM STALK
Lee Tarpley, Donald M. Vietor, and Frederick R. Miller

164–170 LEAF AND PLANT WATER USE EFFICIENCY OF C_4 SPECIES GROWN AT GLACIAL TO ELEVATED CO_2 CONCENTRATIONS
H. Wayne Polley, Hyrum B. Johnson, Herman S. Mayeux, Daniel A. Brown, and James W. C. White

171–179 GROWTH AND PHOTOSYNTHETIC RESPONSES OF *SCAEVOLA SERICEA*, A HAWAIIAN COASTAL SHRUB, TO SUBSTRATE SALINITY AND SALT SPRAY
G. Goldstein, D. R. Drake, C. Alpha, P. Melcher, J. Heraux, and A. Azocar

180–194 RHIZOPHORE AND ROOT DEVELOPMENT IN *SELAGINELLA MARTENSII:* MERISTEM TRANSITIONS AND IDENTITY
Pengzhe Lu and Judith A. Jernstedt

195–202 THE EXISTENCE OF A SPECIAL EXINE COATING IN *GERANIUM ROBERTIANUM* POLLEN
Martina Weber

203–218 A FLORAL ONTOGENETIC STUDY IN THE DIPSACALES
Peter Roels and Erik Smets

219–227 HISTOPATHOLOGY OF *BOTRYOSPHAERIA RIBIS* IN *MELALEUCA QUINQUENERVIA:* PATHOGEN INVASION AND HOST RESPONSE
Min B. Rayachhetry, George M. Blakeslee, and Thomas Miller

228–233 POLLEN GERMINATION AND TUBE GROWTH IN SELFING AND OUTCROSSING POPULATIONS OF *CLARKIA TEMBLORIENSIS* (ONAGRACEAE)
Nancy L. Smith-Huerta

234–239 GENETIC VARIATION AND DIFFERENTIATION AMONG FIVE POPULATIONS OF THE GUANACASTE TREE (*ENTEROLOBIUM CYCLOCARPUM* JACQ.) IN COSTA RICA
O. J. Rocha and J. A. Lobo

240–246 *PALAEOCARPINUS* (EXTINCT BETULACEAE) FROM NORTHWESTERN CHINA: NEW EVIDENCE FOR PALEOCENE FLORISTIC CONTINUITY BETWEEN ASIA, NORTH AMERICA, AND EUROPE
Steven R. Manchester and Guo Shuang-Xing

NUMBER 3, MAY 1996

247–261 ANATOMICAL AND ULTRASTRUCTURAL CHANGES ASSOCIATED WITH SINK-TO-SOURCE TRANSITION IN DEVELOPING MAIZE LEAVES
Ray F. Evert, William A. Russin, and Artemios M. Bosabalidis

262–268 ESTABLISHMENT OF A PLASTOCHRON INDEX AND ANALYSIS OF THE SINK-TO-SOURCE TRANSITION IN LEAVES OF *MORICANDIA ARVENSIS* (L.) DC. (BRASSICACEAE)
Marie-Josée Gagnon and Dwight U. Beebe

269–279 DEVELOPMENT AND STRUCTURE OF OVULE, EMBRYO SAC, EMBRYO, AND ENDOSPERM IN *BUTOMUS UMBELLATUS* (BUTOMACEAE)
Danilo D. Fernando and David D. Cass

280–295 THE DYNAMICS OF SEEDLING AND COTYLEDON CELL DEVELOPMENT IN *ARABIDOPSIS THALIANA* DURING RESERVE MOBILIZATION
S. Gary Mansfield and L. Gregory Briarty

296–302 NUCLEAR RIBOSOMAL DNA UNIT LENGTH VARIATION: A PUTATIVE MARKER OF GENETIC DIVERSITY IN JOJOBA
Valérie Amarger and Louis Mercier

303–308 PHOTOSYNTHETIC AND STOMATAL RESPONSES TO VARIABLE LIGHT IN A COOL-SEASON AND A WARM-SEASON PRAIRIE FORB
Philip A. Fay and Alan K. Knapp

309–315 ACHENE DIMORPHISM AND AMONG-POPULATION VARIATION IN *CREPIS SANCTA* (ASTERACEAE)
Eric Imbert, José Escarré, and Jacques Lepart

316–322 THE EFFECTS OF ACHENE HETEROMORPHISM ON THE DISPERSAL CAPACITY OF *BIDENS PILOSA* L.
O. J. Rocha

323–329 AN EARLY PLEISTOCENE CLOSED-CONE PINE FOREST AT COSTA MESA, SOUTHERN CALIFORNIA
Daniel I. Axelrod and Fran Govean

NUMBER 4, JULY 1996

331–340 HETEROBLASTIC FEATURES OF LEAF ANATOMY IN MAIZE AND THEIR GENETIC REGULATION
D. K. Bongard-Pierce, M. M. S. Evans, and R. S. Poethig

341–372 INFLORESCENCE ONTOGENY AND FLORAL ORGANOGENESIS IN GREVILLEOIDEAE (PROTEACEAE), WITH EMPHASIS ON THE NATURE OF THE FLOWER PAIRS
Andrew W. Douglas and Shirley C. Tucker

373–397 THE DEVELOPMENTAL BASIS OF DIVERSE CARPEL ORIENTATIONS IN GREVILLEOIDEAE (PROTEACEAE)
Andrew W. Douglas and Shirley C. Tucker

398–405 MANGROVE GENETICS. IV. POSTZYGOTIC MUTATIONS FIXED AS PERICLINAL CHIMERAS
Edward J. Klekowski, Jr., Robin Lowenfeld, and Elizabeth H. Klekowski

406–417 BIOMECHANICAL CHARACTERISTICS OF THE ONTOGENY AND GROWTH HABIT OF THE TROPICAL LIANA *CONDYLOCARPON GUIANENSE* (APOCYNACEAE)
Nick P. Rowe and Thomas Speck

418–431 ULTRASTRUCTURE OF MEGASPOROGENESIS AND EARLY MEGAGAMETOGENESIS IN *ARUNDO FORMOSANA* HACK. (POACEAE)
Wann-Neng Jane and Su-Hwa Tsai Chiang

432–439 PRE- AND POSTWINTER CHANGES IN THE ROOT NODULES OF *LATHYRUS MARITIMUS* (L.) BIGEL. WITH SPECIAL REFERENCE TO STORAGE ORGANELLES
Arya K. Bal and Madhukar B. Khetmalas

440–446 MORPHOLOGICAL AND PHYSIOLOGICAL CHANGES DURING THIDIAZURON-INDUCED SOMATIC EMBRYOGENESIS IN GERANIUM (*PELARGONIUM* ×*HORTORUM* BAILEY) HYPOCOTYL CULTURES
M. J. Hutchinson, S. KrishnaRaj, and P. K. Saxena

447–452 PATHOVARS OR *FORMAE SPECIALES* OF *MICROBOTRYUM VIOLACEUM* DIFFER IN ELECTROPHORETIC KARYOTYPE
Michael H. Perlin

453–461 GENES ENCODING 11S-GLOBULIN-LIKE PROTEINS ARE EXPRESSED IN THE MEGAGAMETOPHYTE SOON AFTER FERTILIZATION IN EASTERN WHITE PINE (*PINUS STROBUS* L.)
Stokes S. Baker, Clayton L. Rugh, Frank W. Whitmore, and Joe C. Kamalay

462–467 GENETICS OF *USTILAGO VIOLACEA*. XXXIII. GENETIC EVIDENCE FOR INSERTIONAL MUTATIONS IN THE MAGENTA LOCUS
E. D. Garber and M. Ruddat

468–483 THE *CYCAS PECTINATA* (CYCADACEAE) COMPLEX: GENETIC STRUCTURE AND GENE FLOW
Si-Lin Yang and Alan W. Meerow

484–487 THE SPECIALIZATION HYPOTHESIS FOR PHENOTYPIC PLASTICITY IN PLANTS
Christopher J. Lortie and Lonnie W. Aarssen

488–492 PHENOTYPIC SELECTION ON PLANT HEIGHT IN A SEGREGATING HYBRID POPULATION OF *CREPIS TECTORUM* (ASTERACEAE)
Stefan Andersson

493–500 THE EFFECTS OF GENDER AND PLANT ARCHITECTURE ON ALLOCATION TO FLOWERS IN DIOECIOUS *SILENE LATIFOLIA* (CARYOPHYLLACEAE)
Steven B. Carroll and Lynda F. Delph

501–508 MIXED MATING SYSTEM IN *AGALINIS NEOSCOTICA* (SCROPHULARIACEAE) WITH BUD POLLINATION AND DELAYED POLLEN GERMINATION
Heather M. Stewart, Steven C. Stewart, and J. M. Canne-Hilliker

509–515 *PINUS PONDEROSA* SEEDLING ESTABLISHMENT AND THE INFLUENCE OF COMPETITION WITH THE BUNCHGRASS *AGROPYRON SPICATUM*
Peter F. Kolb and Ronald Robberecht

516–522 SURVIVAL AND GROWTH OF TWO COEXISTING EVERGREEN OAK SPECIES AFTER GERMINATION UNDER DIFFERENT LIGHT CONDITIONS
Hiroyuki Tanouchi

523–524 *IRIDACEAE*, *Paula Rudall*
Reviewed by P. B. Tomlinson

NUMBER 5, SEPTEMBER 1996

525–538 DISTRIBUTION OF TEN ENZYMES OF CARBON METABOLISM IN PEA (*PISUM SATIVUM*) CHLOROPLASTS
Louise E. Anderson, Jack T. Gibbons, and Xingwu Wang

539–545 IMMUNOGOLD LOCALIZATION AND QUANTITATIVE DISTRIBUTION OF TWO PROTEINS OF THE GLYCINE DECARBOXYLASE COMPLEX IN DEVELOPING LEAFLETS OF PEA (*PISUM SATIVUM* L.)
Frédérique C. Guinel and Robert J. Ireland

546–553 NITROGEN AVAILABILITY AND VEGETATIVE DEVELOPMENT INFLUENCE THE RESPONSE OF RIBULOSE 1,5-BISPHOSPHATE CARBOXYLASE/OXYGENASE, PHOSPHOENOLPYRUVATE CARBOXYLASE, AND HEAT-SHOCK PROTEIN CONTENT TO HEAT STRESS IN *ZEA MAYS* L.
Scott A. Heckathorn, Gretchen J. Poeller, James S. Coleman, and Richard L. Hallberg

554–560 REGENERATION OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.): SOMATIC EMBRYOGENESIS AND SHOOT ORGANOGENESIS FROM HYPOCOTYL EXPLANTS INDUCED WITH 6-BENZYLADENINE
Philip O. Newman, Sankaran KrishnaRaj, and Praveen K. Saxena

561–566 OPTIMIZATION OF CONDITIONS FOR IN VITRO POLLEN GERMINATION AND TUBE GROWTH IN POTATOES
Ludmila Říhová, Eva Hrabětová, and Jaroslav Tupý

567–581 A MORPHOMETRIC APPROACH TO THE ARCHITECTURE AND ONTOGENY OF THE EXTANT SPHENOPSID *EQUISETUM TELMATEIA* EHRH.
Véronique Daviero, Brigitte Meyer-Berthaud, and René Lecoustre

582–585 USING DEVELOPING EMBRYOS OF *HORMOSIRA BANKSII* (PHAEOPHYTA) AS A MARINE BIOASSAY SYSTEM
Karen Kevekordes and Margaret N. Clayton

586–594 SHELL STRUCTURE AND EMBRYO DEVELOPMENT OF *PISTACIA VERA* L. AND *P. ATLANTICA* DESF. (ANACARDIACEAE) FOLLOWING INTRA- AND INTERSPECIFIC POLLINATION
Yahya Dehghani Shuraki and Margaret Sedgley

595–604 ULTRASTRUCTURE OF SPORE ONTOGENY IN SPECIES OF *TRICHOPHAEA* (PEZIZALES)
Chi-Guang Wu and James W. Kimbrough

605–614 POPULATION STRUCTURE IN *ZAMIA* (ZAMIACEAE) IN NORTHERN PUERTO RICO. II. SEED GERMINATION AND STAGE-STRUCTURED POPULATION PROJECTION
Vivian Negrón-Ortiz, David L. Gorchov, and Gary J. Breckon

615–620 EXPERIMENTAL CONFIRMATION OF PREFERENTIAL OUTCROSSING IN *BANKSIA*
Susan M. Carthew, Robert J. Whelan, and David J. Ayre

621–631 NUTRIENT LEVELS AND SALINITY AFFECT GENDER AND FLORAL TRAITS IN THE AUTOGAMOUS *SPERGULARIA MARINA*
Véronique A. Delesalle and Susan J. Mazer

632–637 CYTOGENETIC RELATIONSHIPS BETWEEN THE *ERAGROSTIS CURVULA* AND *E. LEHMANNIANA* COMPLEXES
Byron L. Burson and Paul W. Voigt

638–643 INTERSPECIFIC HYBRIDIZATION BETWEEN *BANKSIA HOOKERIANA* MEISN. AND *BANKSIA PRIONOTES* LINDL. (PROTEACEAE)
M. Sedgley, M. G. Wirthensohn, and K. L. Delaporte

644–655 *PALAEOCARPINUS ASPINOSA* SP. NOV. (BETULACEAE) FROM THE PALEOCENE OF WYOMING, U.S.A.
Steven R. Manchester and Zhi-duan Chen

656–657 *A FIELD GUIDE TO THE FAMILIES AND GENERA OF WOODY PLANTS OF NORTHWESTERN SOUTH AMERICA (COLOMBIA, ECUADOR, PERU): WITH SUPPLEMENTARY NOTES ON HERBACEOUS TAXA, Alwyn H. Gentry*
Reviewed by Michael O. Dillon

NUMBER 6, NOVEMBER 1996

iii–iv REVIEWER LIST

659–673 THE CONTROL OF PINNA MORPHOLOGY IN WILDTYPE AND MUTANT LEAVES OF THE GARDEN PEA (*PISUM SATIVUM* L.)
Bin Lu, Philip J. Villani, John C. Watson, Darleen A. DeMason, and Todd J. Cooke

674–684 ORIGIN AND EARLY DEVELOPMENT OF SECONDARY EMBRYOS IN *QUERCUS SUBER* L.
P. Puigderrajols, B. Fernández-Guijarro, M. Toribio, and M. Molinas

685–697 MINOR VEIN DIFFERENTIATION AND THE DEVELOPMENT OF SPECIALIZED PLASMODESMATA BETWEEN COMPANION CELLS AND CONTIGUOUS CELLS IN EXPANDING LEAVES OF *MORICANDIA ARVENSIS* (L.) DC. (BRASSICACEAE)
Marie-Josée Gagnon and Dwight U. Beebe

698–702 CARPEL DEVELOPMENT IN *TASMANNIA INSIPIDA* (WINTERACEAE)
Dawn Frame-Purguy

703–712 SEED DEVELOPMENT AND ABORTION IN *VITIS VINIFERA* L., CV. CHARDONNAY
A. Ebadi, M. Sedgley, P. May, and B. G. Coombe

713–721 JASMONIC ACID: EFFECTS ON GROWTH AND DEVELOPMENT OF ISOLATED TOMATO ROOTS CULTURED IN VITRO
Pariana Tung, Tanya S. Hooker, Patricia A. Tampe, David M. Reid, and Trevor A. Thorpe

722–728 SHADING, OSMOTICUM, AND HORMONE EFFECTS ON ORGAN DEVELOPMENT FOR DETACHED CLADODES OF *OPUNTIA FICUS-INDICA*
Park S. Nobel

729–732 EFFECT OF DROUGHT STRESS ON GROWTH, WATER RELATIONS, AND GAS EXCHANGE OF TWO LINES OF SUNFLOWER DIFFERING IN DEGREE OF SALT TOLERANCE
M. Ashraf and J. W. O'Leary

733–738 POLLINATOR BEHAVIOR AND POSTPOLLINATION REPRODUCTIVE SUCCESS IN ALTERNATIVE FLORAL PHENOTYPES OF *CLARKIA GRACILIS* (ONAGRACEAE)
Kristina Niovi Jones

739–745 EXPLOSIVE ANTHER DEHISCENCE IN *RICINUS COMMUNIS* L. INVOLVES CELL WALL MODIFICATIONS AND RELATIVE HUMIDITY
Massimo Bianchini and Ettore Pacini

746–749 SIMILARITY OF SEED BANKS TO ABOVEGROUND VEGETATION IN GRAZED AND UNGRAZED SALT MARSH COMMUNITIES ON THE GOWER PENINSULA, SOUTH WALES
Irwin A. Ungar and S. R. J. Woodell

750–758 CYTOLOGY AND MORPHOLOGY OF *ELYMUS HOFFMANNI* (POACEAE: TRITICEAE): A NEW SPECIES FROM THE ERZURUM PROVINCE OF TURKEY
K. B. Jensen and K. H. Asay

761–766 VOLUME 157 CONTENTS

767 VOLUME 157 AUTHOR INDEX

768–769 VOLUME 157 SUBJECT INDEX

NUMBER 6 SUPPLEMENT, NOVEMBER 1996

S1–S3 INTRODUCTION TO BIOLOGY AND EVOLUTION OF THE GNETALES
William E. Friedman

S3–S39 SEED PLANT PHYLOGENY AND THE RELATIONSHIPS OF GNETALES
James A. Doyle

S40–S49 SYSTEMATICS OF THE GNETALES: A REVIEW OF MORPHOLOGICAL AND MOLECULAR EVIDENCE
Robert A. Price

S50–S57 THE FOSSIL HISTORY OF THE GNETALES
Peter R. Crane

S58–S76 WOOD, BARK, AND STEM ANATOMY OF GNETALES: A SUMMARY
Sherwin Carlquist

S77–S94 DOUBLE FERTILIZATION IN GNETALES: IMPLICATIONS FOR UNDERSTANDING REPRODUCTIVE DIVERSIFICATION AMONG SEED PLANTS
William E. Friedman and Jeffrey S. Carmichael

S95–S112 THE MORPHOLOGY AND EVOLUTION OF MALE REPRODUCTIVE STRUCTURES OF GNETALES
Larry Hufford

S113–S125 STRUCTURE AND FUNCTION OF FEMALE AND BISEXUAL ORGAN COMPLEXES IN GNETALES
Peter K. Endress